In Table II. we have the dates of maximum height of the Nile, reckoned from the beginning of September as a zero date and the sums of the numbers for two years taken.

In Table III. the numbers record sums for two years of monthly means of the water level at Teddington, reckoned in feet and decimals of a foot; that is to say each number must be divided by 24 in order to get the *mean* of the two years.

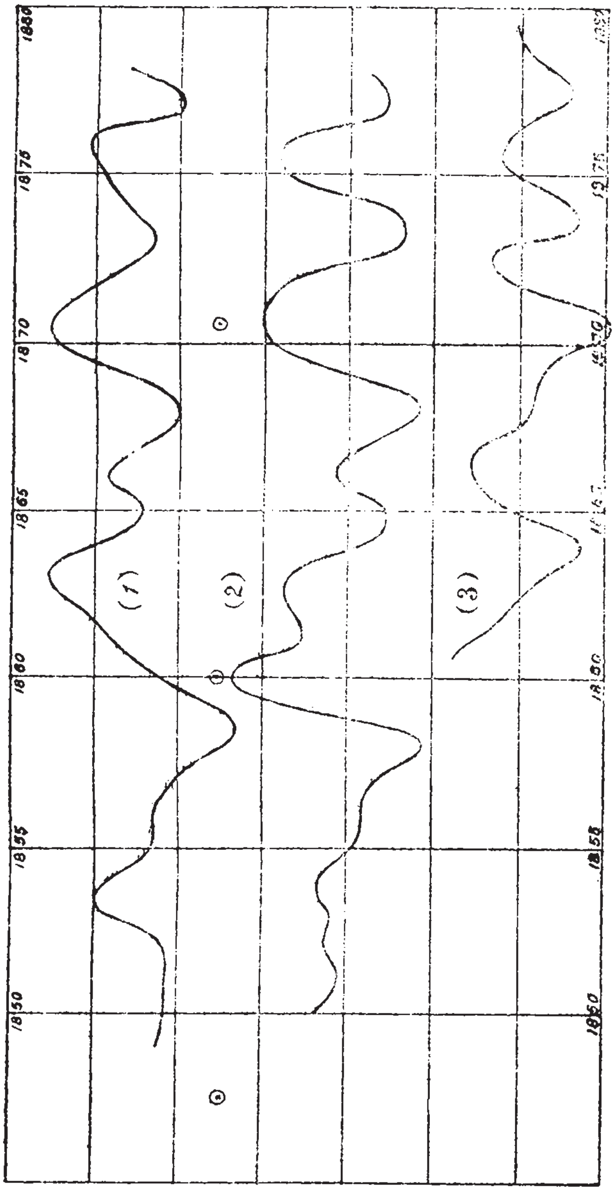

TABLE I.—*Recording the Yearly Heights of the River Nile in the manner already described*

Year.	Height.	Year.	Height.	Year.	Height.
1849	2130	1859	1766	1869	2284
1850	2080	1860	2098	1870	2701
1851	2077	1861	2368	1871	2718
1852	2078	1862	2574	1872	2404
1853	2434	1863	2765	1873	2142
1854	2425	1864	2475	1874	2317
1855	2173	1865	2229	1875	2463
1856	2141	1866	2432	1876	2541
1857	2016	1867	2208	1877	1981
1858	1736	1868	2003	1878	2290

TABLE II.—*Recording the Dates of Maximum Height of the River Nile in the manner already described*

Year.	Date of max.	Year.	Date of max.	Year.	Date of max.
1849-50	64	1859-60	116	1869-70	96
1850-51	54	1860-61	80	1870-71	100
1851-52	63	1861-62	84	1871-72	79
1852-53	60	1862-63	89	1872-73	22
1853-54	68	1863-64	41	1873-74	33
1854-55	48	1864-65	33	1874-75	88
1855-56	43	1865-66	57	1875-76	82
1856-57	37	1866-67	38	1876-77	31
1857-58	10	1867-68	11	1877-78	40
1858-59	71	1868-69	52		

TABLE III.—*Recording the Water Level at Teddington in the manner already described*

Year.	Heights.	Year.	Heights.	Year.	Heights.
1860-61	315·77	1867-68	299·58	1874-75	292·91
1861-62	306·52	1868-69	297·21	1875-76	304·68
1862-63	299·83	1869-70	292·29	1876-77	299·41
1863-64	288·27	1870 71	278·77	1877-78	288·81
1864-65	294·63	1871-72	294·90	1878-79	296·32
1865-66	308·67	1872-73	306·10	1879-80	300·62
1866-67	312·11	1873-74	286·82		

A diagram likewise accompanies this, in which the results are graphically represented, curve (1) denoting the results of Table I., curve (2) those of Table II., and curve (3) those of Table III. In this diagram the dates of sunspot maxima are likewise indicated. From an inspection of this diagram we may perhaps deduce the following conclusions:—

1. The curve representing the heights of the River Nile and that representing the dates of maximum height are very like each other, a maximum height corresponding generally to a late date of maximum rise.

2. There is also a considerable likeness between the Nile curve and that for the River Thames.

3. There appears to be a maximum in these curves at or somewhat after the date of maximum sun-spots, but they have more than one maximum for one sun-spot cycle.

It would be extremely interesting if this comparison could be still further extended. BALFOUR STEWART

OLEO-MARGARINE

IT is now doubtless known to most people that much of what by courtesy goes by the name of butter is only very distantly related to the dairy produce which has hitherto enjoyed a prescriptive right to that appellation. If any of our readers were ignorant of this fact, the interesting and instructive statement which the Chairman of Committee, in his capacity as a private member, laid before the House during the last Session will have fully enlightened them on that point, as indeed it enlightened, and seemingly astonished, Honourable Members. During the past ten years a new industry has been created. It came into existence very quietly, and under the taint of illegitimacy, and consequently the world in general knew very little about it. Thanks, however, to the operations of Sanitary Boards, Officers of Health, and Food Analysts, it was eventually dragged out into the light of day, when, despite the circumstance that the greater part of its existence had been spent in out-of-the-way places and without the fostering recognition of authority, it stood revealed as an astonishingly well-grown and highly prosperous business. The industry in the outset was set going to manufacture a product from beef-suet to be used in the adulteration of butter, and enormous quantities of this product were made in this country and in America for this purpose. The fraud was, however, so repeatedly exposed, and convictions against grocers and others selling this adulterated butter were so frequently obtained, that the vendors were driven to so far take the public into their confidence as to declare that the product was "a butter-substitute," and hence arose the euphemism of "butterine," by which it be-

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came generally known. Now these remarks are in no sense derogatory to the value of this product as an article of food. We quite agree with Dr. Playfair that "butterine" may be, and frequently is, very much better than many qualities of butter; but this fact cannot be held to defend or extenuate the practice of substituting "butterine" for butter without the knowledge and consent of the purchaser. The common-sense of buyers and sellers has practically settled this point. The manufacture of "butterine" has now reached such extraordinary proportions that we are bound to recognise it as a legitimate industry: the substance is now sold openly for what it is and on its merits, and it is perfectly obvious that it supplies a public demand. A recent report by Mr. Bateman to the Board of Trade, on the manufacture of these "butter substitutes" in the United States, throws fresh light on the subject, and the statistics which the report contains are calculated to afford a very precise idea as to the magnitude of the industry. The greater part of the substance is made in the States by the patented method of M. Mége Mouries. The process is as follows:—The beef suet, on arriving at the factory, is thrown into tanks containing tepid water, and after standing a short time it is repeatedly washed in cold water, and disintegrated and separated from fibre by passing through a "meat-hasher" worked by steam, after which it is forced through a fine sieve. It is then melted by surrounding the tanks with water of a temperature of about 120° F.; great care is taken not to exceed this point, otherwise the fat would begin to decompose and acquire a flavour of tallow. After being well stirred, the adipose membrane subsides to the bottom of the tank, and is separated under the name of "scrap," whilst a clear yellow oil is left above, together with a film of white oily substance. This is removed by skimming, and the yellow oil is drawn off and allowed to solidify. The refined fat, as the substance is now termed, is then taken to the press-room, which is kept at a temperature of about 90° F., and is packed in cotton cloths and placed in galvanised iron plates in a press; on being subjected to pressure oil flows away, and cakes of pure white stearine remain: these find their way to the candle-makers. The oil is known as "oleo-margarine": it is packed in barrels for sale or export, or is directly made into "butterine" by adding 10 per cent. of milk to it, and churning the mixture. The product is coloured with annato and rolled with ice to "set" it; salt is then added, and the "butterine" is ready for packing in kegs. The taste of "butterine" is described as being similar to that of second-class butter, but it is rather more salt; owing to the very small quantity of the characteristic fats of natural butter—the so-called "butyrin," "caprin," &c., which it contains, it lacks the flavour of high-class butter. On the other hand, as these fats are specially liable to become rancid, butterine is free from the disgusting smell and taste of the lowest class butters.

The composition of natural butter and of "butterine" may be stated as follows:—

		Butter.	"Butterine."
Water		11·968	11·203
Solids		88·032	88·797
		100·000	100·000
Insoluble Fats	Olein Palmitin	23·824	24·893
	Stearin Arachin Myristin	51·422	56·298
Soluble Fats	Butyrin Caprin Caproin Caprylin	7·432	1·823
Casein		0·192	0·621
Salt		5·162	5·162
Colouring Matter		trace	trace
		88·032	88·797

It will be seen that in the main "butterine" is very similar in chemical composition to butter, and its value as an article of food is probably quite as high. Indeed to some people "butterine" might possibly be more wholesome, owing to its comparative freedom from the readily decomposable fats which are apt in some cases to be specially disagreeable; for cooking purposes it may be safely averred that the artificial butter would be generally preferable, owing to the ready alteration of butyrin and its congeners by heat.

The yield of oleo-margarine is found to be about 35 per cent. of the beef caul fat employed, and its present retail price may be set down as about one shilling per pound. It is very difficult to obtain an accurate return of the production of oleo-margarine and butterine; but it is certain that in the Eastern States of America alone the yearly manufacture is not less than ten million pounds. Chicago and the West, moreover, contribute their share, and Mr. Nimmo, the chief of the U.S. Statistical Department, states that the export of oleo-margarine for the year ending June 30, 1880, was close upon nineteen million pounds. Probably this is under-estimated, for it is almost certain that considerable quantities of "butterine" passed through the Customs under the designation of butter.

The exports of oleo-margarine from the port of New York in 1879 and in the first nine months of 1880 are given in the annexed table:—

Cleared for	Year 1879. Pounds.	January 1 to Sept. 30, 1880—9 months. Pounds.
Rotterdam	11,931,174	11,127,574
Antwerp	173,537	1,367,526
London	188,426	58,639
Liverpool	1,091,266	590,974
Glasgow	274,023	1,399,694
Other ports	222,438	1,215,246
	13,880,864	15,759,653

Of the 15¾ million pounds which were exported in the first nine months of 1880, 12½ millions went to Holland, there to be churned into butterine, most of which is sent into this country. Statistics show that the import of "butterine" into this country from Holland goes on in the same ratio as the import of oleo-margarine from the States into Holland. The poor British farmer has indeed cause to grumble: for not only do the Americans, as he says, send him "acres and acres" of bad weather, and upset all his calculations as to his crops, but the 'cute Yankee and the persevering Dutchman between them give him no chance even with his dairy-produce! The world in general, however, will not complain of "butterine," provided that its composition does not differ materially from that shown by Dr. Mott's analysis given above, but unfortunately from its very nature and the somewhat anomalous position it even yet holds, it is very liable to sophistication, and the people who adulterate butter with oleo-margarine are liable to get the oleo-margarine adulterated to begin with. An ingenious American has recently sought to place butter, as he calls it, *on a soap-stone basis*, by which is implied that finely-ground soapstone added to the fat will, in his opinion, make a marketable commodity! We are told, on high authority, that if we ask for bread we are not to be offered "a stone": neither are we when we ask for butter. T.

SCIENTIFIC EDUCATION IN LIVERPOOL

IN the youngest city of the Empire, which on Saturday witnessed the inauguration, by Lord Derby, of its new university, already endowed with more than a hundred thousand pounds, the public recognition of the practical value of scientific education to the community, commenced only in 1860, when Sir William Brown gave to the town the magnificent pile of buildings forming the Free Library and Museum, which at once received from the late Lord

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